Claims

1. An isolated polypeptide comprising the amino acid sequence of SEQ ID NO:5, or a fragment thereof having at least 14 consecutive amino acids of SEQ ID NO:5.

2. An isolated immunogenic polypeptide comprising the amino acid sequence of SEQ ID NO:12, or a functional variant thereof.

3. The isolated immunogenic polypeptide of claim 2 wherein the isolated immunogenic peptide consists of an amino acid sequence selected from the group consisting of SEQ ID NO:5, SEQ ID NO:9 and SEQ ID NO:12.

4. The isolated immunogenic polypeptide of claim 1 wherein the isolated polypeptide consists of the amino acid sequence of SEQ ID NO:12.

5. The isolated polypeptide of claim 1 or claim 2 wherein the isolated polypeptide is non-hydrolyzable.

6. The isolated polypeptide of claim 5 wherein the isolated polypeptide is selected from the group consisting of peptides comprising D-amino acids, peptides comprising a -psi[CH_2NH]-reduced amide peptide bond, peptides comprising a -psi[$COCH_2$]-ketomethylene peptide bond, peptides comprising a -psi[CH(CN)NH]-(cyanomethylene)amino peptide bond, peptides comprising a -psi[$CH_2CH(OH)$]-hydroxyethylene peptide bond, peptides comprising a -psi[CH_2O]-peptide bond, and peptides comprising a -psi[CH_2S]-thiomethylene peptide bond.

7. A composition comprising the isolated immunogenic polypeptide of claim 2.

8. The composition of claim 7, further comprising an isolated non-alt.M-CSF tumor rejection antigen peptide or a precursor thereof.

9. The composition of claim 7, wherein the isolated immunogenic polypeptide comprises the amino acid sequence of SEQ ID NO:12.

10. The composition of claim 9, wherein the isolated immunogenic polypeptide consists of an amino acid sequence selected from the group consisting of SEQ ID NO:5, SEQ ID NO:9, and SEQ ID NO:12.

11. An isolated nucleic acid encoding a peptide selected from the group consisting of the polypeptide of claim 1 and the immunogenic polypeptide of claim 2, wherein the isolated nucleic acid, when translated in frame, does not encode M-CSF, a precursor of M-CSF, or a ~~fragment of M-CSF~~.

12. The isolated nucleic acid of claim 11, wherein the nucleic acid comprises SEQ ID NO:11.

13. An expression vector comprising the isolated nucleic acid of claim 11 operably linked to a promoter.

14. The expression vector of claim 13 wherein the nucleic acid comprises SEQ ID NO:11.

15. The expression vector of claims 13 or 14 further comprising a nucleic acid which encodes an HLA-B*3501 molecule.

16. A host cell transfected or transformed with an expression vector selected from the group consisting of the expression vector of claim 13, the expression vector of claim 14, and the expression vector of claim 15.

17. A host cell transfected or transformed with an expression vector selected from the group of the expression vector of claim 11 and the expression vector of claim 12, and wherein the host cell expresses an HLA-B*3501 molecule.

18. A method for enriching selectively a population of T lymphocytes with $CD8^+$ T lymphocytes specific for an alt.M-CSF immunogenic polypeptide comprising:

contacting an isolated population of T lymphocytes with an agent presenting a complex of the alt.M-CSF immunogenic polypeptide and an HLA class I molecule in an

amount sufficient to selectively enrich the isolated population of T lymphocytes with the $CD8^+$ T lymphocytes.

19. The method of claim 18, wherein the agent is an antigen presenting cell contacted with an alt.M-CSF immunogenic polypeptide comprising the amino acid sequence of SEQ ID NO:12.

20. The method of claim 18 or 19 wherein the HLA class I molecule is an HLA-B*3501 molecule and wherein the alt.M-CSF immunogenic polypeptide is selected from the group ~~consisting of:~~

a peptide consisting of the amino acid sequence of SEQ ID NO:5, a peptide consisting of the amino acid sequence of SEQ ID NO:9, and a peptide consisting of the amino acid sequence of SEQ ID NO:12.

21. A method for diagnosing a disorder characterized by expression of an alt.M-CSF polypeptide comprising:

contacting a biological sample isolated from a subject with an agent that is specific for the alt.M-CSF polypeptide, and

determining the interaction between the agent and the alt.M-CSF polypeptide as a determination of the disorder.

22. The method of claim 21 wherein the alt.M-CSF polypeptide comprises the amino acid sequence of SEQ ID NO:12.

23. The method of claim 22, wherein the alt.M-CSF polypeptide is selected from the group consisting of:

a polypeptide consisting of the amino acid sequence of SEQ ID NO:5 and a polypeptide consisting of the amino acid sequence of SEQ ID NO:12.

24. A method for diagnosing a disorder characterized by expression of an alt.M-CSF immunogenic polypeptide which forms a complex with an HLA class I molecule, comprising:

contacting a biological sample isolated from a subject with an agent that binds the

complex; and

determining binding between the complex and the agent as a determination of the disorder.

25. The method of claim 24 wherein the HLA class I molecule is an HLA-B*3501 molecule and the alt.M-CSF immunogenic polypeptide comprises the amino acid sequence of SEQ ID NO:12.

26. The method of claim 25, wherein the alt.M-CSF immunogenic polypeptide is selected from the group consisting of:

a peptide consisting of the amino acid sequence of SEQ ID NO:5 and a peptide consisting of the amino acid sequence of SEQ ID NO:12.

27. A method for treating a subject having a disorder characterized by expression of alt.M-CSF, comprising:

administering to the subject an amount of an alt.M-CSF immunogenic polypeptide sufficient to ameliorate the disorder.

28. The method of claim 27 wherein the alt.M-CSF immunogenic polypeptide comprises the amino acid sequence of SEQ ID NO:12, or a functional variant thereof.

29. The method of claim 28, wherein the alt.M-CSF immunogenic polypeptide is selected from the group consisting of:

a peptide consisting of the amino acid sequence of SEQ ID NO:5, a peptide consisting of the amino acid sequence of SEQ ID NO:9, and a peptide consisting of the amino acid sequence of SEQ ID NO:12.

30. A method for treating a subject having a disorder characterized by expression of alt.M-CSF, comprising:

administering to the subject an amount of an agent which enriches selectively in the subject the presence of complexes of an HLA class I molecule and an alt.M-CSF immunogenic polypeptide, sufficient to ameliorate the disorder.

31. The method of claim 30 wherein the HLA class I molecule is an HLA-B*3501 molecule and the alt.M-CSF immunogenic polypeptide comprises the amino acid sequence of SEQ ID NO:12, or a functional variant thereof.

32. The method of claim 31, wherein the alt.M-CSF immunogenic polypeptide is selected from the group consisting of:

a peptide consisting of the amino acid sequence of SEQ ID NO:5, a peptide consisting of the amino acid sequence of SEQ ID NO:9, and a peptide consisting of the amino acid sequence of SEQ ID NO:12.

33. A method for treating a subject having a disorder characterized by expression of alt.M-CSF, comprising:

administering to the subject an amount of autologous $CD8^+$ T lymphocytes sufficient to ameliorate the disorder, wherein the $CD8^+$ T lymphocytes are specific for complexes of an HLA class I molecule and an alt.M-CSF immunogenic polypeptide.

34. The method of claim 33 wherein the HLA class I molecule is an HLA-B*3501 molecule and the alt.M-CSF immunogenic polypeptide comprises the amino acid sequence of SEQ ID NO:12, or a functional variant thereof.

35. The method of claim 34, wherein the alt.M-CSF immunogenic polypeptide is selected from the group consisting of:

a peptide consisting of the amino acid sequence of SEQ ID NO:5, a peptide consisting of the amino acid sequence of SEQ ID NO:9, and a peptide consisting of the amino acid sequence of SEQ ID NO:12.

36. A method for identifying functional variants of an alt.M-CSF immunogenic polypeptide, comprising

selecting an alt.M-CSF immunogenic polypeptide, an HLA class I binding molecule which binds the alt.M-CSF immunogenic polypeptide or fragment thereof, and a T lymphocyte which is stimulated by the alt.M-CSF immunogenic polypeptide or fragment thereof presented by the HLA class I binding molecule;

adding deleting or substituting a first amino acid residue of the alt.M-CSF immunogenic polypeptide to prepare a variant peptide;

determining the binding of the variant peptide to HLA class I binding molecule and the stimulation of the T lymphocyte, wherein binding of the variant peptide to the HLA class I binding molecule or stimulation of the T lymphocyte by the variant peptide presented by the HLA class I binding molecule indicates that the variant peptide is a functional variant of the alt.M-CSF immunogenic polypeptide.

37. The method of claim 36, wherein the alt.M-CSF immunogenic polypeptide comprises the amino acid sequence of SEQ ID NO:12.

38. The method of claim 36, further comprising the step of comparing the stimulation of the T lymphocyte by the alt.M-CSF immunogenic polypeptide and the stimulation of the T lymphocyte by the functional variant as a determination of the effectiveness of the stimulation of the T lymphocyte by the functional variant.

39. The method of claim 36, further comprising the step of adding, deleting or substituting at least one second amino acid to prepare a variant peptide, and

determining the binding of the variant peptide to HLA class I binding molecule and the stimulation of the T lymphocyte, wherein binding of the variant peptide to the HLA class I binding molecule or stimulation of the T lymphocyte by the variant peptide presented by the HLA class I binding molecule indicates that the variant peptide is a functional variant of the alt.M-CSF immunogenic polypeptide.

40. An isolated polypeptide which binds selectively a polypeptide of any of claims 1, 2, 3 or 4, provided that the isolated polypeptide is not an HLA class I molecule.

41. The isolated polypeptide of claim 40, wherein the isolated polypeptide is an antibody.

42. The antibody of claim 41, wherein the antibody is a monoclonal antibody.

43. The antibody of claim 41, wherein the antibody is a chimeric antibody or a humanized

antibody.

44. The isolated polypeptide of claim 40, wherein the isolated polypeptide is an antibody fragment selected from the group consisting of a Fab fragment, a $F(ab)_2$ fragment or a fragment including a CDR3 region selective for an alt.M-CSF immunogenic polypeptide.

45. An isolated $CD8^+$ T lymphocyte which selectively binds a complex of an HLA class I molecule and an alt.M-CSF immunogenic polypeptide.

46. The isolated $CD8^+$ T lymphocyte of claim 45 wherein the HLA class I molecule is an HLA-B*3501 molecule and wherein the alt.M-CSF immunogenic polypeptide comprises the amino acid sequence of SEQ ID NO:12, or a functional variant thereof.

47. The isolated $CD8^+$ T lymphocyte of claim 46 wherein the alt.M-CSF immunogenic polypeptide is selected from the group consisting of:

a peptide consisting of the amino acid sequence of SEQ ID NO:5, a peptide consisting of the amino acid sequence of SEQ ID NO:9, and a peptide consisting of the amino acid sequence of SEQ ID NO:12.

48. An isolated antigen presenting cell which comprises a complex of an HLA class I molecule and an alt.M-CSF immunogenic polypeptide.

49. The isolated antigen presenting cell of claim 48 wherein the HLA class I molecule is an HLA-B*3501 molecule and wherein the alt.M-CSF immunogenic polypeptide comprises the amino acid sequence of SEQ ID NO:12, or a functional variant thereof.

50. The isolated antigen presenting cell of claim 49 wherein the alt.M-CSF immunogenic polypeptide is selected from the group consisting of:

a peptide consisting of the amino acid sequence of SEQ ID NO:5, a peptide consisting of the amino acid sequence of SEQ ID NO:9, and a peptide consisting of the amino acid sequence of SEQ ID NO:12.

51. A method for identifying a candidate mimetic of an alt.M-CSF immunogenic polypeptide, comprising

providing a HLA molecule which binds an alt.M-CSF immunogenic polypeptide or a fragment thereof,

contacting the HLA molecule with a test molecule, and

determining the binding of the test molecule to the HLA molecule, wherein a test molecule which binds to the HLA molecule is a candidate mimetic of an alt.M-CSF immunogenic polypeptide.

52. The method of claim 51, further comprising

forming a complex of the HLA molecule and the candidate mimetic,

contacting the complex with a T cell which binds to a complex of an HLA molecule and an alt.M-CSF immunogenic polypeptide, and

assaying activation of the T cell.

53. The method of claim 52, wherein activation of the T cell is indicated by a property selected from the group consisting of proliferation of the T cell, interferon-γ production by the T cell, tumor necrosis factor production by the T cell, and cytolysis of a target cell by the T cell.

54. A vaccine composition comprising a nucleic acid encoding an alt.M-CSF immunogenic polypeptide comprising the amino acid sequence of SEQ ID NO:5 or an immunogenic fragment thereof.

55. The vaccine composition of claim 54, wherein the nucleic acid is contained in a vector selected from the group consisting of adenoviruses, adeno-associated viruses, poxviruses, vaccinia viruses, attenuated poxviruses, Semliki Forest virus, Venezuelan equine encephalitis virus, retroviruses, Sindbis virus, Ty virus-like particle and recombinant bacteria.

56. The vaccine composition of claim 54, wherein the alt.M-CSF immunogenic polypeptide or immunogenic fragment thereof comprises the amino acid sequence of SEQ ID NO:12.

57. The vaccine composition of claim 54, further comprising a nucleic acid encoding a non-alt.M-CSF immunogenic polypeptide or an immunogenic fragment thereof.

58. A vaccine composition comprising an immunogenic fragment of SEQ ID NO:5.

59. The vaccine composition of claim 58, wherein the immunogenic fragment comprises the amino acid sequence of SEQ ID NO:12.

60. The vaccine composition of claim 58, further comprising a non-alt.M-CSF immunogenic polypeptide or an immunogenic fragment thereof.

61. A vaccine composition comprising a cell which expresses an alt.M-CSF nucleic acid or polypeptide, or an immunogenic fragment thereof.

62. The vaccine composition of claim 61, the cell further comprising a non-alt.M-CSF nucleic acid or polypeptide, or an immunogenic fragment thereof.

63. The vaccine composition of any of claims 54-62, further comprising an adjuvant.

64. The vaccine composition of any of claims 54-62, further comprising a pharmaceutically acceptable carrier.